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Melen

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(54) **STEREOGRAPHIC IMAGE COMPRESSION WITH IMAGE MOMENT NORMALIZATION**

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(52) **U.S. Cl.** **348/43**; 382/154; 382/232; 382/298; 345/127

(58) **Field of Search** 348/42, 43, 384, 348/390; 382/298, 232, 154; 345/127

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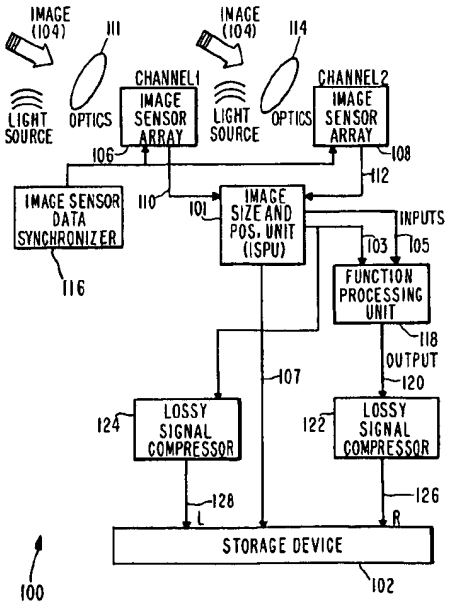
(57) **ABSTRACT**

A stereographic image compressor (**100**) includes an Image Size and Position Unit (ISPU) (**101**) that resizes and repositions a pair of images which are indicative, respectively, of first and second fields of view (**111, 114**) of an image (**104**) and which are generated by a pair of image sensor arrays (**106, 108**). The ISPU (**101**) causes both images to have a same size and position. The ISPU (**101**) generates a first modified image signal (**103**) and a second modified image signal (**105**) indicative of such resized and repositioned images. A function processing unit (**118**) generates a difference signal (**120**) indicative of differences between the first modified image signal (**103**) and the second modified image signal (**105**) The difference signal (**120**) is compressed by a lossy compressor (**122**) for storage on a storage device (**102**). The first modified image signal (**103**) is also compressed by a lossy compressor (**124**) for storage on the storage device (**102**). The image signals (**110** and **112**) are time synchronized by an image data synchronizer (**116**). The function processing unit (**118**) generates difference signal (**120**) by way of one of a plurality of mathematical operations.

19 Claims, 6 Drawing Sheets



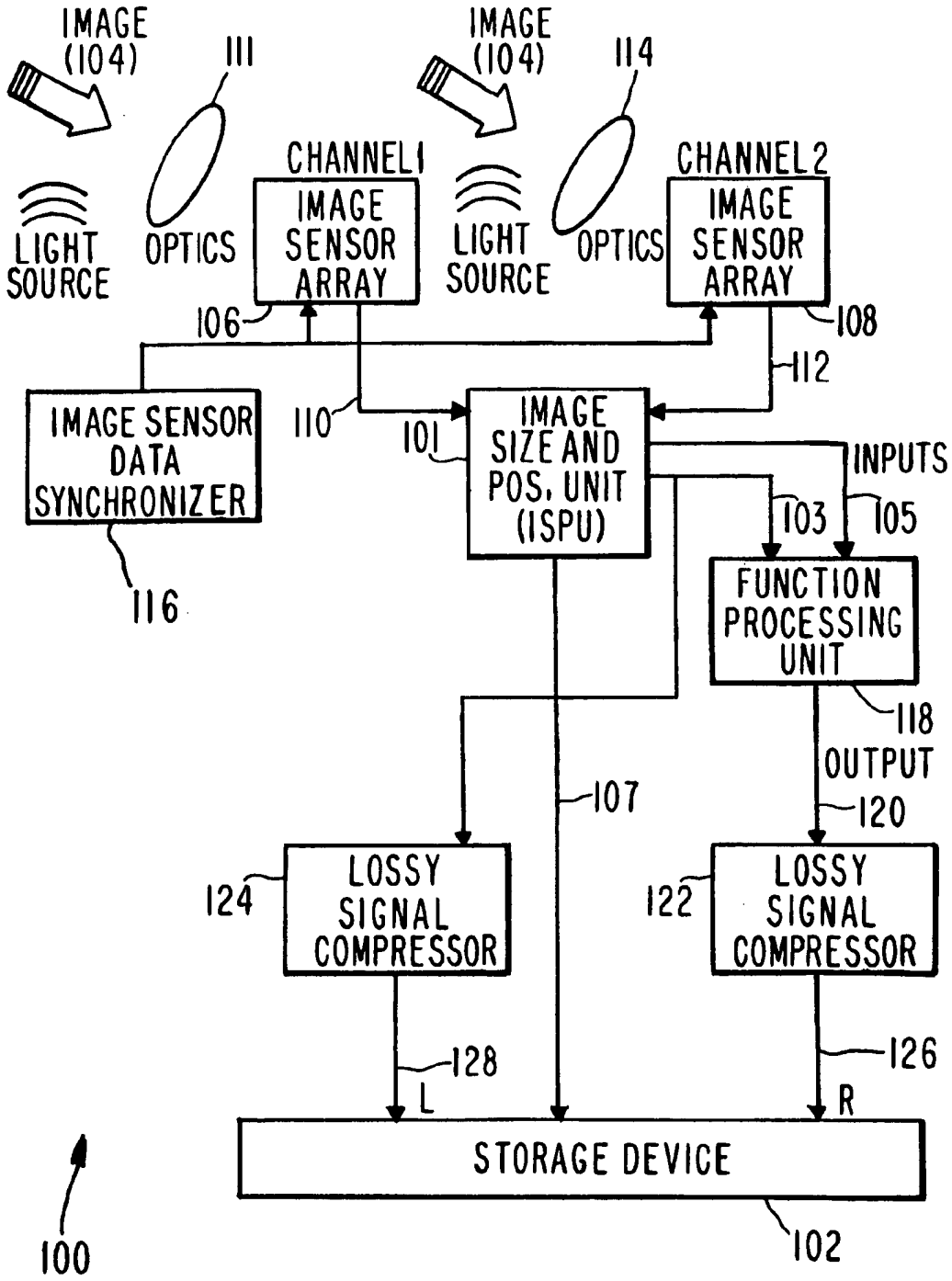


IMAGE (104)
111
IMAGE (104)
114
CHANNEL1
CHANNEL2
LIGHT SOURCE
OPTICS
IMAGE SENSOR ARRAY
LIGHT SOURCE
OPTICS
IMAGE SENSOR ARRAY
106
108
112
IMAGE SENSOR DATA SYNCHRONIZER
110
101
IMAGE SIZE AND POS. UNIT (ISPU)
INPUTS
103
105
116
FUNCTION PROCESSING UNIT
118
OUTPUT
120
107
LOSSY SIGNAL COMPRESSOR
124
LOSSY SIGNAL COMPRESSOR
122
128
126
L
R
STORAGE DEVICE
102
100

Figure 1

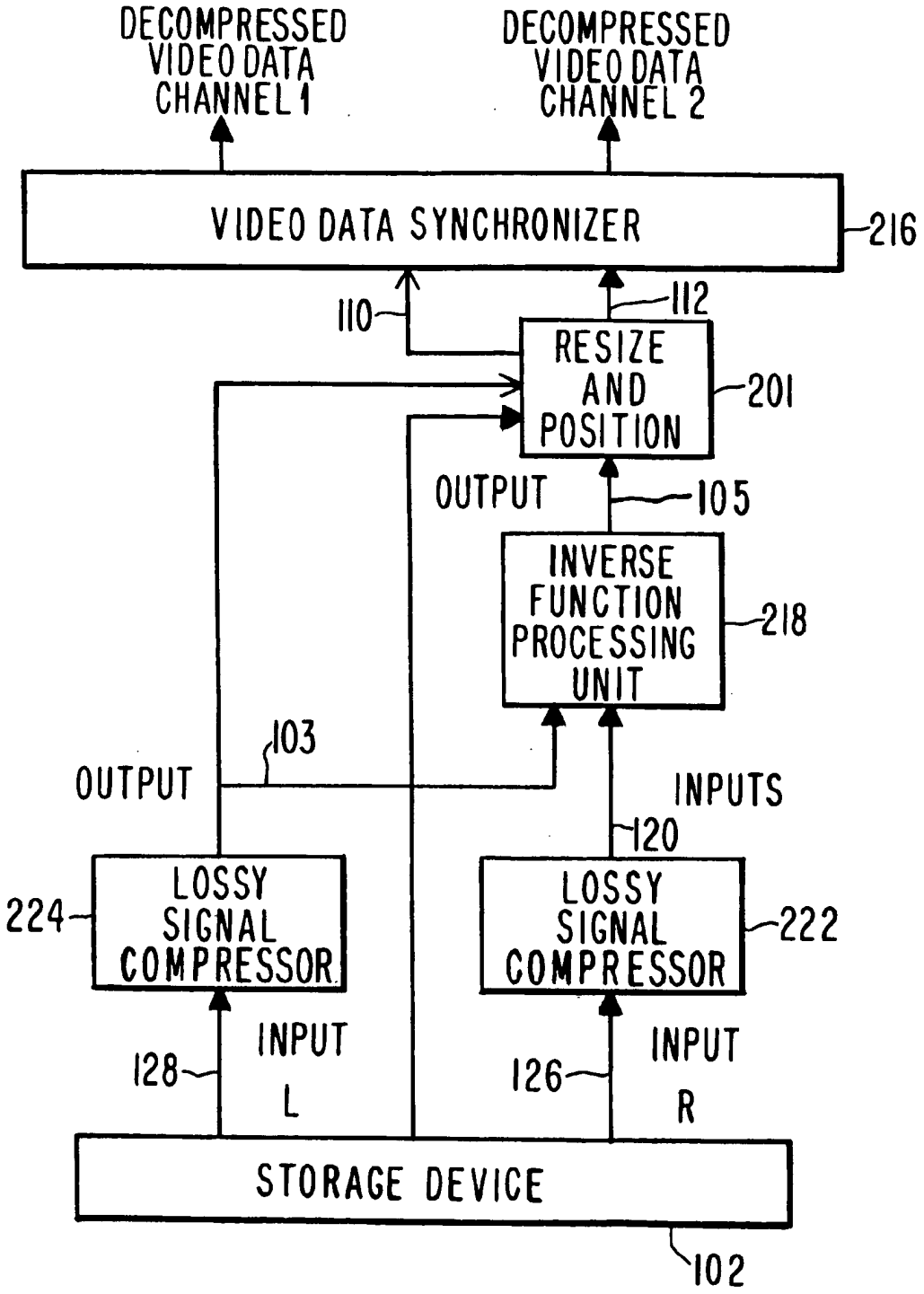

DECOMPRESSED VIDEO DATA CHANNEL 1
DECOMPRESSED VIDEO DATA CHANNEL 2
VIDEO DATA SYNCHRONIZER
216
110
112
RESIZE AND POSITION
201
OUTPUT
105
INVERSE FUNCTION PROCESSING UNIT
218
103
OUTPUT
INPUTS
120
224
LOSSY SIGNAL COMPRESSOR
LOSSY SIGNAL COMPRESSOR
222
128
INPUT L
126
INPUT R
STORAGE DEVICE
102

Figure 2

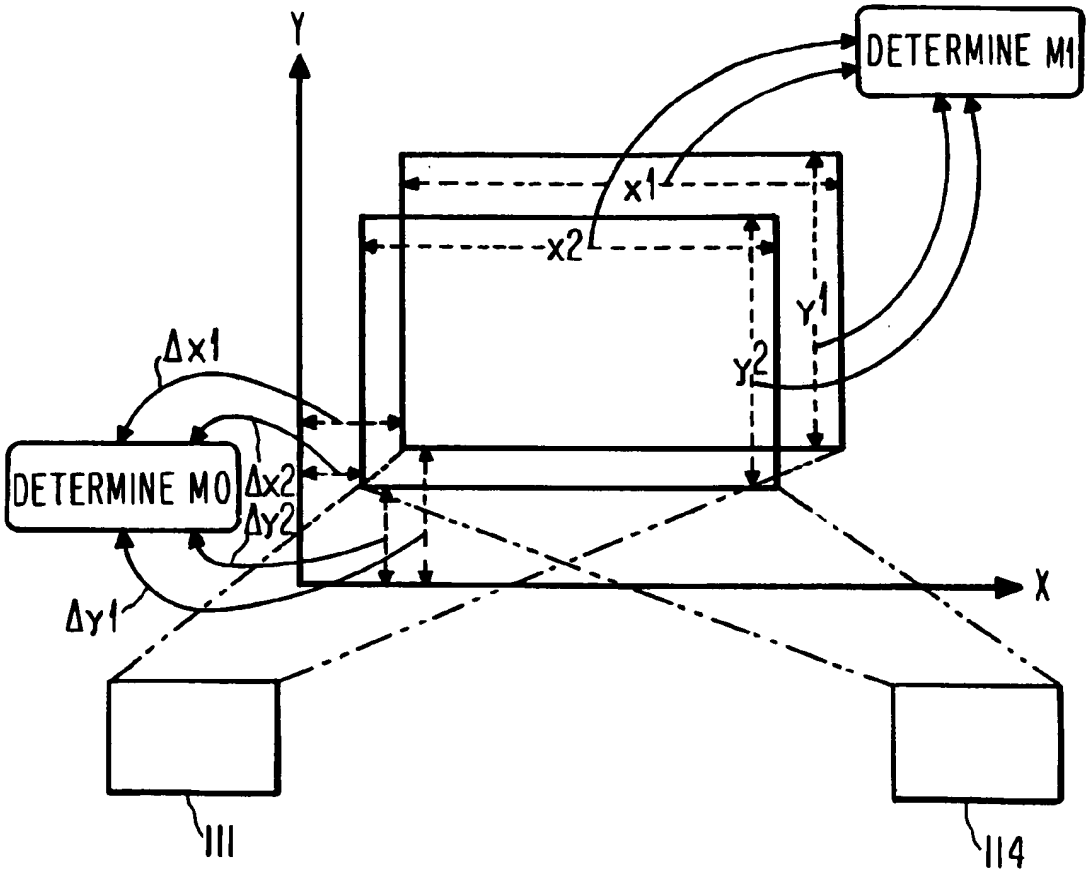

Y
DETERMINE M1
x1
x2
y1
y2
Δx1
DETERMINE M0
Δx2
Δy2
Δy1
X
111
114

Figure 3

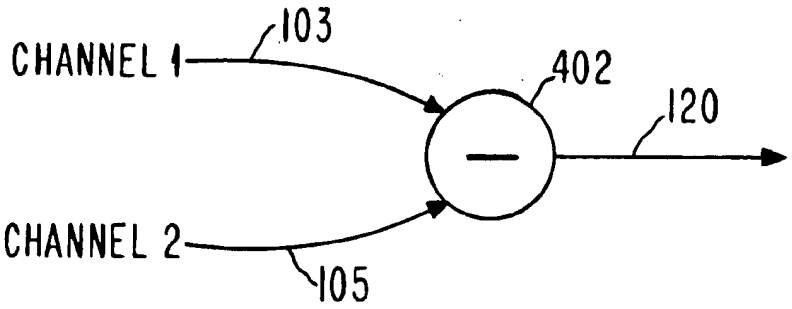


Figure 4(a)

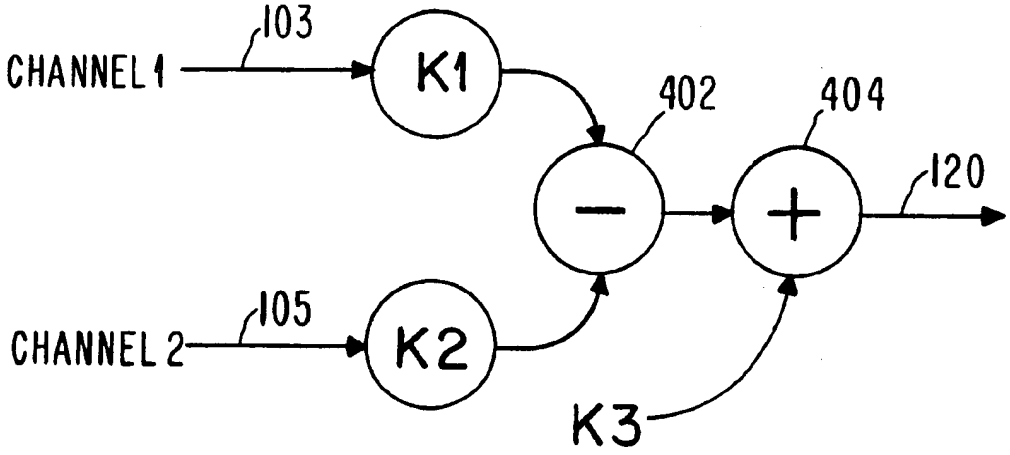


Figure 4(b)

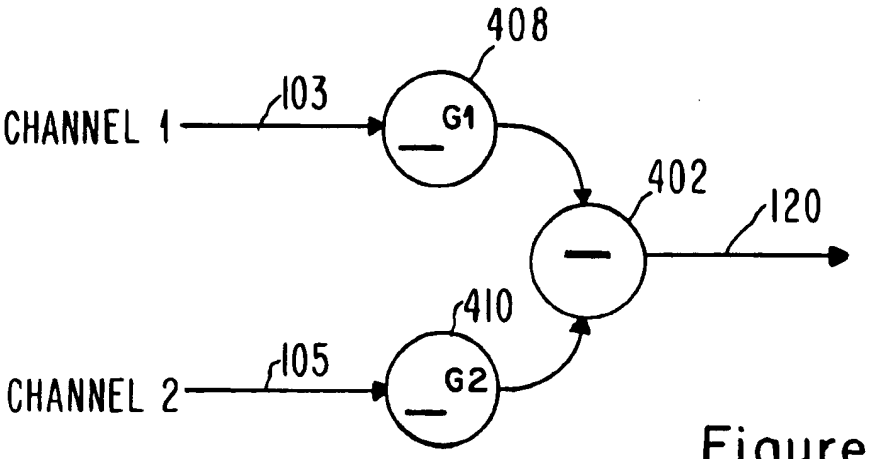


Figure 4(c)

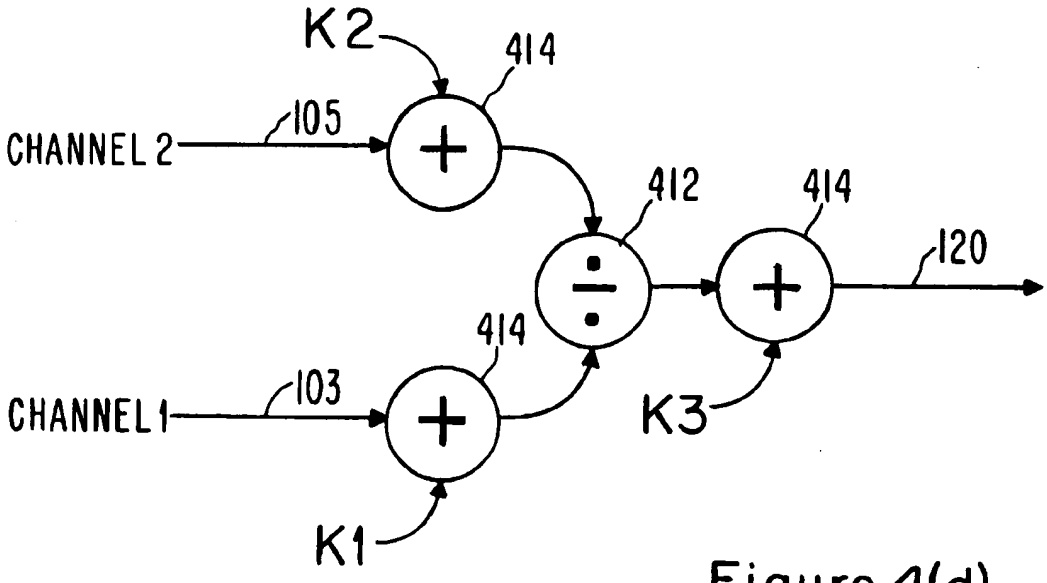


Figure 4(d)

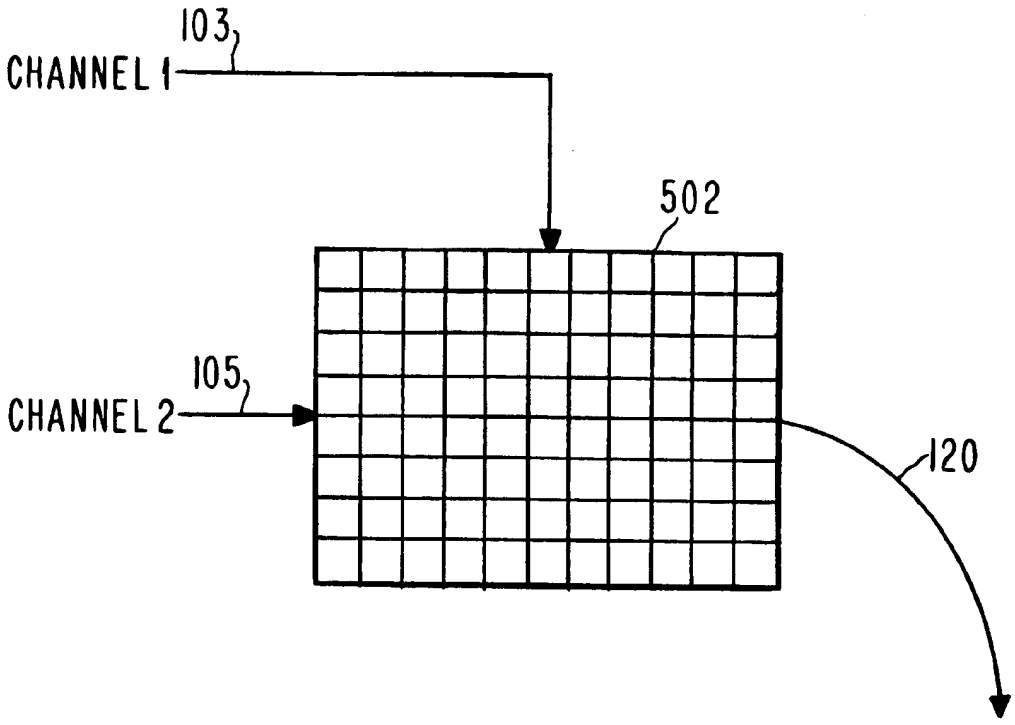


Figure 5

STEREOGRAPHIC IMAGE COMPRESSION WITH IMAGE MOMENT NORMALIZATION

RELATED APPLICATIONS

This application is related to the following U.S. Patent Applications which are filed concurrently herewith and which are assigned to the assignee of the present application:

STEREOGRAPHIC IMAGE COMPRESSION WITH IMAGE DIFFERENCE GENERATION AND LOSSY COMPRESSION; AND STEREOGRAPHIC IMAGE COMPRESSION WITH ADAPTIVE CONTROL PARAMETER GENERATION.

TECHNICAL FIELD

This invention relates generally to the field of image compression and more particularly to the field of compression of stereographic images.

BACKGROUND ART

Stereographic images are typically generated with two electronic image sensing arrays. These arrays are positioned at a distance from each other to create a pair of images having different fields of view of the same scene. The resulting pair of images can then be used to create a composite image containing depth information. Such depth information provides increased realism by providing a three-dimensional (3D) type view.

A significant drawback to such images is the increased data generated by the pair of images and the associated increased storage requirements for such data. The data generated by the dual arrays is twice the amount of data generated for an image having only a single field of view. High resolution images, which contain more data, amplify this problem. U.S. Patent Application entitled "STEREOGRAPHIC IMAGE COMPRESSION WITH IMAGE DIFFERENCE GENERATION AND LOSSY COMPRESSION," referenced above discloses novel techniques for compressing stereographic images.

A further problem with stereographic images is the difference in size and position between the images generated by the pair of sensing images. Typically, the difference in size and position result from differences between the sensing arrays and in the positioning of the sensing arrays relative to the scene being captured. Such differences result in increased distortion and reduced compressibility. Accordingly, there is a need for a system which reduces or eliminates differences in size and position of the pair of images contained in a stereographic image.

BRIEF SUMMARY OF THE INVENTION

The present invention advantageously provides resizing and repositioning of two fields of view that comprise a stereographic image. In a principal aspect, a stereographic image compressor (**100**) comprises an image size and position unit (**101**) which is responsive to a first image signal (**110**) and a second image signal (**112**). The first image signal (**110**) contains image information of a scene (**104**) from a first field of view (**111**) and the second image signal (**112**) contains image information of the scene from a second field of view (**114**). The image size and position unit (**101**) resizes and repositions images represented by the first and second image signals (**110, 112**) to generate a modified first image signal (**103**) and a modified second image signal (**105**). The modified first signal (**103**) and the modified second signal (**105**) each represent an image characterized by a same size and position The function processing unit (**118**) generates a difference image signal (**120**) that is indicative of differences between the modified first image signal (**103**) and the modified second image signal (**105**). A lossy compressor (**126**) compresses information contained in the difference image signal (**120**) to generate a compressed image information signal (**126**).

In certain preferred embodiments, the compressed image information signal (**126**) is stored along with the modified first or second image signals (**103, 105**), which is also preferably compressed. The scene (**104**) represented by the first (**110**) and second (**112**) image signals, together with depth information associated with the combination of the two signals (**103, 105**), can then be recreated for display from the stored first image signal (**103** or **105**), and the compressed image information signal (**126**). Resizing and/or repositioning the images representing the two fields of view **111** and **114** advantageously reduces data storage requirements and improves image quality.

These and other features and advantages of the present invention may be better understood by reference to the attached specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a stereographic image compression system employing the principles of the present invention.

FIG. **2** is a block diagram illustrating generation of a stereographic image from data generated by the system of FIG. **1**.

FIG. **3** is a block diagram illustrating operation of the image size and position unit of FIG. **2**.

FIGS. **4**(*a–d*) are block diagrams showing alternative embodiments of the function processing unit of FIG. **1**.

FIG. **5** is a block diagram showing further details of a specific embodiment of the function processing unit of FIG. **1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. **1**, a stereographic image compression system **100**, operates to generate compressed image data, **126** and **128**, indicative of stereographic images for storage in storage device **102**. The image information stored in storage device **102** preferably comprises two channels of information. The two channels of information are generated by image sensor arrays **106** and **108**. Image sensor array **106** generates an image signal **110** indicative of a first field of view **111** of image **104**. Image sensor array **108** generates an image signal **112** indicative of a second field of view **114** of image **104**.

Image sensor arrays **106** and **108** are positioned at a predetermined distance from one another and at predetermined angles relative to one another to generate fields of view **111** and **114**. Preferably image sensor arrays **106** and **108** are each conventional and employ charge coupled device technology or other conventional image sensing mechanisms that provide an electronic signal indicative of image **104**. It is preferable that sensor arrays **106** and **108** are closely matched to minimize differences in signals **110** and **112** introduced by device variations in sensors **106** and **108**.

Image signals **110** and **112** are time varying signals which are preferably synchronized by way of image data synchronizer **116** to cause signals **110** and **112** to provide time synchronized images of fields of view **111** and **114** and allow the data contained in such signals to be operated on an individual array picture element (pixel) basis. Image data

synchronizer **116** operates generally to cause signals **110** and **112** to be time synchronized. This may be accomplished in a number of ways including controlling arrays **106** and **108** to generate signals **110** and **112** synchronously. Alternatively, the image data synchronizer may receive signals **110** and **112**, and compare time stamps which may be contained in such signals and control the transmission of signals **110** and **112** to the other destinations such as blocks **118** and **124**.

Image signals **110** and **112** are received by Image Size and Position Unit (ISPU) **101** which modifies size and/or position of images represented by signals **110** and **112** to generate signals **103** and **105** that represent fields of view **111** and **114** respectively and are of like size and position. Corrected image signals **103** and **105** are received by function processing unit **118** which generates a difference signal **120** indicative of differences between signals **103** and **105**. Difference signal **120** is compressed by a lossy signal compressor **122** to generate signal **126** which is stored on storage device **102**. A second lossy signal compressor **124** compresses corrected image signal **103** also for storage in storage device **102**. Alternatively, lossy signal compressor **124** may receive signal **105** to generate signal **128**. Lossy signal compressors **122** and **124** are preferably conventional and may employ one of a variety of known compression techniques including JPEG, motion JPEG, or MPEG compression algorithms. The compressed difference signal **126** generated by lossy signal compressor **122** and the compressed signal **128** generated by lossy signal compressor **124** advantageously comprise all of the information required to generate a stereographic type image of image **104**.

The system shown in FIG. **1** is shown for purposes of explanation only and should not be construed to be limiting in any way. Modules **101**, **116**, **118**, **122** and **124** can be implemented in hardware, software and/or firmware.

The image stored on storage device **102** may be recreated in a manner shown in FIG. **2**. The functions shown in blocks **222**, **224**, **218**, **201** and **216** essentially perform the inverse function of the corresponding functions shown in FIG. **1** to generate two channels **110** and **112** of data. Lossy signal compressors **224** and **222** receive data signals **128** and **126** respectively and decompress the received signals to generate signals **103** and **120**. Inverse function processing unit **218** receives signals **103** and **120** and generates data signal **105**. ISPU **201** receives signal **105** and generates image signals **110** and **112**. Videodata synchronizer **216** receives signals **110** and **112**, synchronizes the two signals to generate two channels of data (channel **1** and channel **2**) which can be used in a conventional manner to generate a stereographic image.

FIG. **3** illustrates operation of ISPU **101**. FIG. **3** shows the relative size and position, by way of example in a two-dimensional space characterized by a horizontal (x) axis and a vertical (y) axis, of first field of view **111** and second field of view **114**. As shown, fields of view **111** and **114** have different sizes and positions. Field of view **111** is characterized by a first size (X1 by Y1) and a first position (ΔX1, ΔY1). Field of view **114** is characterized by a second size (X2 by Y2) and a second position (ΔX2, ΔY2). The difference in size and position between the two fields of view **111** and **114** can occur for a variety of reasons. Small variations in the relative angle between sensor array **106**, **108** and image **104** results in each sensor array **106** and **108** capturing an image having a field of view that represents a different portion of image **104**. Variations in the sensors **106** and **108**, caused by normal manufacturing processes, or gradual degradation of the sensor, result in each sensor array **106** and **108** capturing an image of slightly different size.

ISPU **101** employs a horizontal and vertical axis, such as shown in FIG. **3** to determine the relative size and position of fields of view **111** and **114**. The axes simply provide a reference point and the exact positioning of the axes is therefore not important. ISPU **101** determines a first moment value (**M0**) indicative of a difference in relative position between fields of view **111** and **114** as a function of values (ΔX1, ΔY1) and (ΔX2, ΔY2). ISPU **101** also determines a second moment value (**M1**) indicative of a difference in size between fields of view **111** and **114** as a function of (X1, Y1) and (X2, Y2). The moment values M0 and M1 are used by ISPU **101** to resize and/or reposition one or both fields of view **111** and **114**. In essence, the ISPU **101** normalizes the moments, represented by moment values **M0** and **M1**, of fields of view **111** and **114**.

Determination of which of the images are resized and/or repositioned may be accomplished in a variety of ways. For example, the images may be resized and repositioned in accordance with a predetermined size and position. This approach provides simplicity of implementation but does not account for variations in the sensors **106** and **108** over time due to small movements in the position of the sensors or degradation of the sensor arrays **106** and **108**. The resizing and repositioning may also be selectable by a user based on different criteria, such as image compressibility. Fields of view that have the same size and position have background images that are aligned and thus are characterized by greater compressibility.

User decisions as to resizing and positioning may also be based on image quality considerations. For example, perspective in images is ideally achieved by making background images at infinity from both fields of view to be identical. Thus, the amount of resizing and repositioning may be determined by trial and error based on user preferences as to the quality of perspective achieved by the system **100**.

Function processing unit **118** is now described in further detail. Function processing unit **118** preferably takes one of a variety of forms to realize one of a plurality of desired mathematical functions to generate difference signal **120**. Four example embodiments of the mathematical functions realized by function processing unit **118** are shown in FIGS. **4**(*a*), **4**(*b*), **4**(*c*) and **4**(*d*). In FIG. **4**(*a*), function processing unit **118**, generates signal **120** by way of a subtraction function **402** that generates a difference between corresponding components of signals **110** and **112**. In FIG. **4**(*b*) function processing unit **118** scales signals **110** and **112** by respective constants K1 and K2. The difference between corresponding components of the scaled signals is then generated by subtraction function **402**. This difference is further modified by addition of an offset represented by constant K3 to generate signal **120**. In FIG. **4**(*c*), function processing unit **118** signals **110** and **112** are gamma corrected by exponential values G1 and G2. Gamma correction may be used to correct for a variety of physical phenomena such as matching dynamic range of sensors **106** and **108**. For example, if the sensors **106** and **108** provide data, such as twelve-bits per pixel, which exceeds the capacity of the storage device **102** (which may ideally have a capability of eight-bits per pixel) then gamma correction may be used to narrow the dynamic range of the signals **110** and **112** to match the storage capacity of the storage device **102**. As a further example, gamma correction may be used to correct for sensor non-linearity. The resulting signals are then fed to subtraction function **402** which generates difference signal **120**. In FIG. **4**(*d*), signals **110** and **112** are first scaled by addition of constants K1 and K2 respectively. The resulting

signals are then divided by module **412**. The resulting value is then modified by way of addition of constant **K3** to generate signal **120**.

The embodiments shown in FIGS. **3**, **4**(*a*), **4**(*b*), **4**(*c*) and **4**(*d*), may operate on either digital or analog representations of signals **110** and **112**. The constants such as **K1**, **K2**, **K3**, **G1** and **G2** that are used for scaling, offsetting or gamma-correcting are preferably either predetermined or selectable to generate difference signal **120** in a manner that provides an acceptable image quality but meets the storage requirements of a particular application. Preferably, the mathematical function shown in FIGS. **4**(*a*), **4**(*b*), **4**(*c*) and **4**(*d*) or other acceptable mathematical function, may be selectable by a user. The user can thus judge which function is appropriate based on prior experience. Alternatively, the functions shown in FIGS. **4**(*a*) to **4**(*d*) may be chosen based on a display providing indication of the amount of output data bandwidth required to represent the difference signal **126**.

FIG. **5** shows an embodiment of function processing unit **118** which operates on digital representations of signals **103** and **105**. In FIG. **5**, a look-up table **502** is used to store values indicative of predetermined relationships between signals **103** and **105**. The lookup table **502** may advantageously be implemented by conventional random-access type of memories. Signals **103** and **105** are used as addresses to access table **502** to generate stored data values **120**. The embodiment shown in FIG. **5** advantageously provides rapid generation of signal **120** in response to signals **103** and **105**. In the embodiment shown in FIG. **5**, the data synchronizer **116**, ISPU **101** and lossy signal compressors **122** and **124** may also be implemented by digital mechanisms, including programmed digital computers. In alternative embodiments, function processing unit **118** may be realized by analog circuit components to perform the addition, subtraction, multiplication and division functions shown in FIGS. **4**(*a*), **4**(*b*), **4**(*c*) and **4**(*d*). For such analog embodiments data synchronizer **116**, ISPU **101**, and signal compressors **122** and **124** may be implemented with either analog or digital mechanisms (including hardware and software) to meet the cost, performance, packaging and other requirements of a particular application.

The goal of the output data **120** of the function processing unit **118** is to represent an approximation to the incoherence between the element data of the two sensor arrays **106** and **108**. This transensor incoherence advantageously compresses highly with traditional lossy compression techniques such as employed by compressors **124** and **122**. This high compression factor is due to the large amount of spatial coherence present in many regions of the transensor incoherence data. For the extreme case of the image sensors **106** and **108** imaging only far away image objects, the two sensors may have an identical synchronized output data. For this case, utilizing a simple difference processing function such as implemented in FIG. **4**(*a*) results in all zero data from the output of function processing unit **118**. This all zero data compresses highly with many lossy compression algorithms. Using this method on many photographic scenes using a spacing between sensors **106** and **108** of an amount approximately the inter-ocular spacing of the human eye, the amount of compression achieved may be much higher than for the case where lossy compression is directly applied to the output of the two sensors. For the case of directly applied compression the image data for two channels is approximately two times the data required for one image channel. While using the function processing techniques described herein, the two channels may require only 10–20% more data size than one channel alone.

The principles described herein may be used with a single frame of image data for still image photography, as well as with time sequential frames for video images as described above. For stationary image scenes a single sensor (**106** or **108**) may be used to generate depth information by recording the image **104** at two different points in time to capture fields of view **111** and **114**. In this case, the image sensor output is stored from two different locations. The function processing unit **118**, ISPU **101** and lossy compressors **122** and **124** simply operate on the stored data rather than the data directly from the image sensors.

It is to be understood that the specific mechanisms and techniques which have been described are merely illustrative of one application of the principles of the invention. Numerous modifications may be made to the methods and apparatus described without departing from the true spirit of the invention.

What is claimed is:

1. A stereographic image compressor comprising:

an image size and position unit, responsive to a first image signal containing image information of a scene from a first field of view, and a second image signal containing image information of said scene from a second field of view, for selectively resizing and repositioning said images represented by said first and said second image signals based upon input from a user, to generate a modified first image signal and a modified second image signal, said modified first image signal and said modified second image signal each characterized by a same size and position;

a function processing unit, having a plurality of modes selectable by said user, responsive to said modified first image signal and said modified second image signal, for generating a difference image signal, indicative of differences between said modified first image signal and said modified second image signal; and

a lossy compressor, responsive to said difference image signal, for compressing image information contained in said difference image signal, to generate a compressed image information signal.

2. A stereographic image compressor as set forth in claim **1** wherein said image size and position unit further generates size and position modification information indicative of a first difference between said modified first image signal and said first image signal and indicative of a second difference between said modified second image signal and said second image signal.

3. A stereographic image compressor as set forth in claim **2** further comprising a storage device for storing said compressed image information signal, said modified first image signal and said size and position modification information.

4. A stereographic image compressor as set forth in claim **3** further comprising a synchronizer for causing said first image signal and said second image signal to be time synchronized.

5. A stereographic image compressor as set forth in claim **1** further comprising a storage device for storing said compressed image information signal and said modified first image signal.

6. A stereographic image compressor as set forth in claim **1** further comprising a synchronizer for causing said first image signal and said second image signal to be time synchronized.

7. Apparatus for resizing and repositioning image data taken of a similar field of view from two different locations, said apparatus comprising:

synchronizing means, responsive to a pair of image signals, comprising a first image signal containing image information corresponding to a first of said two locations and a second image signal containing image information corresponding to a second of said two locations, for time synchronizing said first image signal with said second image signal;

image size and position means, responsive to said synchronizing means, and reconfigurable in response to commands provided by a user, for modifying said first image signal and said second image signal to generate a modified first image signal and a modified second image signal, said first and second modified image signals being characterized by a single size and position of said field of view;

difference generation means, responsive to said image size and position means, and reconfigurable in response to commands provided by said user, for generating a difference signal, indicative of differences between said first and said second modified image signals; and

lossy compressor means, responsive to said difference generation means, for compressing said difference signal.

8. A method for compressing stereographic image data, said method comprising:

generating a first image signal indicative of a first field of view of an image;

generating a second image signal indicative of a second field of view of an image;

modifying said first image signal and said second image signal reconfigurably in response to commands introduced by a user to generate a modified first image signal and a modified second image signal, said first field of view represented by said first image signal being equal in size and position to said second field of view represented by said second image signal;

in response to commands introduced by said user, reconfigurably generating a difference signal indicative of differences in images indicated by said modified first image signal and said modified second image signal;

performing lossy compression on said difference signal to generate a compressed difference signal and performing lossy compression on said modified first image signal to generate a first compressed image signal; and

causing storage of said compressed difference signal and said first compressed image signal to a storage device.

9. A method as set forth in claim **8** further comprising the step of generating a size and position modification signal indicative of a difference between said first image signal and said modified first image signal and indicative of a difference between said second image signal and said modified second image signal.

10. A method as set forth in claim **9** further comprising the step of causing storage of said size and position modification signal to said storage device.

11. A computer readable storage medium comprising a stereographic image compressor, comprising:

an image size and position unit, reconfigurably responsive to command signals emanating from a user and responsive to a first image signal containing image information of a scene from a first field of view, and a second image signal containing image information of said scene from a second field of view, for resizing and repositioning said images represented by said first and said second image signals to generate a modified first image signal and a modified second image signal, said modified first image signal and said modified second image signal each characterized by a same size and position;

a function processing unit, reconfigurably responsive to command signals emanating from said user and responsive to said modified first image signal and said modified second image signal, for generating a difference image signal, indicative of differences between said modified first image signal and said modified second image signal; and

a lossy compressor, responsive to said difference image signal, for compressing image information contained in said difference image signal, to generate a compressed image information signal.

12. A stereographic image compressor comprising:

an image size and position unit, responsive to a first image signal containing image information of a scene from a first field of view, and a second image signal containing image information of said scene from a second field of view, for selectively resizing and repositioning said images represented by said first and said second image signals based upon input from a user, to generate a modified first image signal and a modified second image signal, said modified first image signal and said modified second image signal each characterized by a same size and position;

a function processing unit, having a plurality of modes selectable by said user, responsive to said modified first image signal and said modified second image signal, for generating a difference image signal, indicative of differences between said modified first image signal and said modified second image signal; and

a lossy compressor, responsive to said difference image signal, for compressing image information contained in said difference image signal, to generate a compressed image information signal;

wherein the resizing and repositioning of the images are selectable by the user based upon at least one of image compressability considerations, trial and error, and image quality considerations.

13. A stereographic image compressor comprising:

an image size and position unit, responsive to a first image signal containing image information of a scene from a first field of view, and a second image signal containing image information of said scene from a second field of view, for selectively resizing and repositioning said images represented by said first and said second image signals based upon input from a user, to generate a modified first image signal and a modified second image signal, said modified first image signal and said modified second image signal each characterized by a same size and position;

a function processing unit, having a plurality of modes selectable by said user, responsive to said modified first image signal and said modified second image signal, for generating a difference image signal, indicative of differences between said modified first image signal and said modified second image signal; and

a lossy compressor, responsive to said difference image signal, for compressing image information contained in said difference image signal, to generate a compressed image information signal;

wherein the modes of the function processing unit comprise at least one of the following:

the modified first image signal and the modified second image signal are each scaled by constants, creating two new signals which are subtracted from each other and augmented by the addition of an offset;

the modified first image signal and the modified second image signal are each gamma corrected by exponential values, creating two gamma corrected signals which are subtracted from each other; and

the modified first image signal and the modified second image signal are each augmented by the addition of constants, creating two resulting signals which are divided then augmented by the addition of a constant.

14. Apparatus for resizing and repositioning image data taken of a similar field of view from two different locations, said apparatus comprising:

synchronizing means, responsive to a pair of image signals, comprising a first image signal containing image information corresponding to a first of said two locations and a second image signal containing image information corresponding to a second of said two locations, for time synchronizing said first image signal with said second image signal;

image size and position means, responsive to said synchronizing means, and reconfigurable in response to commands provided by a user, for modifying said first image signal and said second image signal to generate a modified first image signal and a modified second image signal, said first and second modified image signals being characterized by a single size and position of said field of view;

difference generation means, responsive to said image size and position means, and reconfigurable in response to commands provided by said user, for generating a difference signal, indicative of differences between said first and said second modified image signals; and

lossy compressor means, responsive to said difference generation means, for compressing said difference signal;

wherein said reconfigurable image size and position means has at least one of the following modes:

a mode based upon image compressibility considerations;

a mode based upon trial and error; and

a mode based upon image quality considerations.

15. Apparatus for resizing and repositioning image data taken of a similar field of view from two different locations, said apparatus comprising:

synchronizing means, responsive to a pair of image signals, comprising a first image signal containing image information corresponding to a first of said two locations and a second image signal containing image information corresponding to a second of said two locations, for time synchronizing said first image signal with said second image signal;

image size and position means, responsive to said synchronizing means, and reconfigurable in response to commands provided by a user, for modifying said first image signal and said second image signal to generate a modified first image signal and a modified second image signal, said first and second modified image signals being characterized by a single size and position of said field of view;

difference generation means, responsive to said image size and position means, and reconfigurable in response to commands provided by said user, for generating a difference signal, indicative of differences between said first and said second modified image signals; and

lossy compressor means, responsive to said difference generation means, for compressing said difference signal;

wherein the difference generation means is reconfigurable to exhibit at least one of the following characteristics:

the modified first image signal and the modified second image signal are each scaled by constants, creating two new signals which are subtracted from each other and augmented by the addition of an offset;

the modified first image signal and the modified second image signal are each gamma corrected by exponential values, creating two gamma corrected signals which are subtracted from each other; and

the modified first image signal and the modified second image signal are each augmented by the addition of constants, creating two resulting signals which are divided then augmented by the addition of a constant.

16. A method for compressing stereographic image data, said method comprising:

generating a first image signal indicative of a first field of view of an image;

generating a second image signal indicative of a second field of view of an image;

modifying said first image signal and said second image signal reconfigurably in response to commands introduced by a user to generate a modified first image signal and a modified second image signal, said first field of view represented by said first image signal being equal in size and position to said second field of view represented by said second image signal;

in response to commands introduced by said user, reconfigurably generating a difference signal indicative of differences in images indicated by said modified first image signal and said modified second image signal;

performing lossy compression on said difference signal to generate a compressed difference signal and performing lossy compression on said modified first image signal to generate a first compressed image signal; and

causing storage of said compressed difference signal and said first compressed image signal to a storage device;

wherein the step of modifying said first image signal and said second image signal reconfigurably takes into account at least one of image compressibility considerations, trial and error, and image quality considerations.

17. A method for compressing stereographic image data, said method comprising:

generating a first image signal indicative of a first field of view of an image;

generating a second image signal indicative of a second field of view of an image;

modifying said first image signal and said second image signal reconfigurably in response to commands introduced by a user to generate a modified first image signal and a modified second image signal, said first field of view represented by said first image signal being equal in size and position to said second field of view represented by said second image signal;

in response to commands introduced by said user, reconfigurably generating a difference signal indicative of differences in images indicated by said modified first image signal and said modified second image signal;

performing lossy compression on said difference signal to generate a compressed difference signal and performing lossy compression on said modified first image signal to generate a first compressed image signal; and

causing storage of said compressed difference signal and said first compressed image signal to a storage device;

wherein the step of reconfigurably generating a difference signal is performed using one of the following techniques:

the modified first image signal and the modified second image signal are each scaled by constants, creating two new signals which are subtracted from each other and augmented by the addition of an offset;

the modified first image signal and the modified second image signal are each gamma corrected by exponential values, creating two gamma corrected signals which are subtracted from each other; and

the modified first image signal and the modified second image signal are each augmented by the addition of constants, creating two resulting signals which are divided then augmented by the addition of a constant.

18. A computer readable storage medium comprising a stereographic image compressor, comprising:

an image size and position unit, reconfigurably responsive to command signals emanating from a user and responsive to a first image signal containing image information of a scene from a first field of view, and a second image signal containing image information of said scene from a second field of view, for resizing and repositioning said images represented by said first and said second image signals to generate a modified first image signal and a modified second image signal, said modified first image signal and said modified second image signal each characterized by a same size and position;

a function processing unit, reconfigurably responsive to command signals emanating from said user and responsive to said modified first image signal and said modified second image signal, for generating a difference image signal, indicative of differences between said modified first image signal and said modified second image signal; and

a lossy compressor, responsive to said difference image signal, for compressing image information contained in said difference image signal, to generate a compressed image information signal;

wherein the image size and position unit is reconfigurable based upon at least one of image compressibility considerations, trial and error, and image quality considerations.

19. A computer readable storage medium comprising a stereographic image compressor, comprising:

an image size and position unit, reconfigurably responsive to command signals emanating from a user and responsive to a first image signal containing image information of a scene from a first field of view, and a second image signal containing image information of said scene from a second field of view, for resizing and repositioning said images represented by said first and said second image signals to generate a modified first image signal and a modified second image signal, said modified first image signal and said modified second image signal each characterized by a same size and position;

a function processing unit, reconfigurably responsive to command signals emanating from said user and responsive to said modified first image signal and said modified second image signal, for generating a difference image signal, indicative of differences between said modified first image signal and said modified second image signal; and

a lossy compressor, responsive to said difference image signal, for compressing image information contained in said difference image signal, to generate a compressed image information signal;

wherein the function processing unit is reconfigurable to operate in at least one of the following modes:

the modified first image signal and the modified second image signal are each scaled by constants, creating two new signals which are subtracted from each other and augmented by the addition of an offset;

the modified first image signal and the modified second image signal are each gamma corrected by exponential values, creating two gamma corrected signals which are subtracted from each other; and

the modified first image signal and the modified second image signal are each augmented by the addition of constants, creating two resulting signals which are divided then augmented by the addition of a constant.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,275,253 B1
DATED : August 14, 2001
INVENTOR(S) : Roger D. Melen

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page,
Item [57], **ABSTRACT**,
Line 13, "(105)" should read -- (105). --.

Column 1,
Lines 35-37, all type should be larger size.

Column 4,
Line 44, "118," should read -- 108 --.

Signed and Sealed this

Seventh Day of May, 2002

Attest:

Attesting Officer

JAMES E. ROGAN
Director of the United States Patent and Trademark Office